



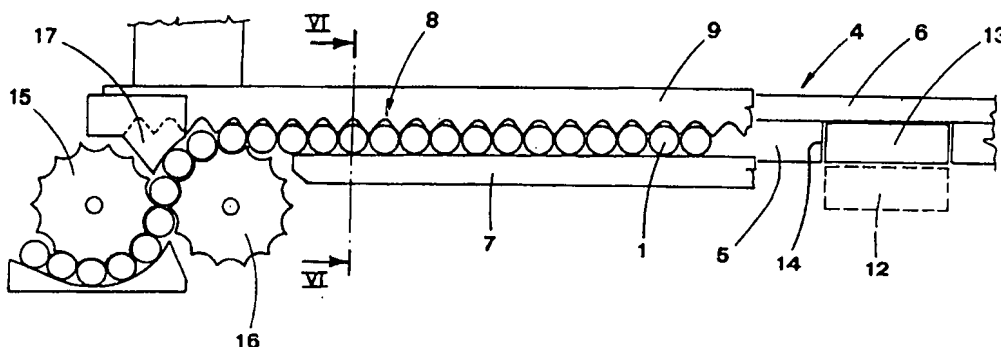
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(54) Title: CONVEYING SYSTEM FOR CARRYING CONTAINERS, ESPECIALLY BOTTLES, THROUGH DIFFERENT WORKING STATIONS



(57) Abstract

A conveyor includes a support element (4), that defines a running surface (5), and an endless dragging belt (9, 10). The belt (9, 10) has seats (3) made, with inwards decreasing section, along one longitudinal edge located over a corresponding section of the surface (5). Containers (1) to be moved rest on the surface (5) and are kept in engagement with the belt (9, 10) and in the seats by a lateral striker (7). The belt can be made of synthetic material with cogs (11), or of metallic material with smooth surfaces. The lateral striker (7) is a bar parallel to the straight active run (8) of the belt (9, 10), and is moved in relation to the containers (1) size. The support and running surface (5) has indentations in one or more points (4), where there are plates (13) for moving the containers clear of the belt so as to allow additional operations on the containers.

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CONVEYING SYSTEM FOR CARRYING CONTAINERS, ESPECIALLY
BOTTLES, THROUGH DIFFERENT WORKING STATIONS

BACKGROUND OF THE INVENTION

5 The present invention relates to a conveying device for
containers, in particular bottles, which are to move
through a series of subsequent working stations.

The working stations include, for instance, one or more
filling stations, one or more weighing stations, closing
10 station etc.

DESCRIPTION OF THE PRIOR ART

It is known that in some production fields, like e.g.
drug production, it is necessary to work in sterile
15 environment, so that the products are free of impurities.

This requirement is met by a widespread technique, known
as "closed environment systems", according to which the
machine is contained inside a stationary structure,
called isolator, closed and sterilised thereinside.

20 Operators work outside the isolator and use suitable
extensible gloves extended thereinside and accessible
from outside in order to perform operations inside the
isolator.

Otherwise, sterile or clean chambers are used, in which
25 the operators, properly protected by sterile overalls,
work directly on the machine.

The sterile chamber is usually placed in the centre of a
system of stations provided with an increasing degree of

sterility, going from outside toward inside, protecting one another.

Usually, flow-controlled suitably filtered air passes in the sterile stations.

- 5 It is helpful to specify that sterile environments are identified according to a conventional class, which according to the US regulation FS209E, results from the number of pollution particles, microbes and other inorganic parts present in a unit of air (in this case a
10 cubic foot equal to 0.0283 cubic metres).

Using the above mentioned sterile stations, it is necessary to avoid as much as possible the presence of pollution sources.

- In particular, it is generally required that the machines
15 working in sterile stations be not equipped with moving means which use, during normal operation, prismatic guides.

- For this purpose, engines equipped with these guides along which they reciprocate, are generally contained
20 inside hermetic structures separated from the sterile station and called grey or non-clean environments.

Anyway, the sterile environments are sterilised, with predetermined frequency, by means of suitable disinfectants and the like.

- 25 Other types of conveying lines, that are designed for transportation of the above mentioned containers, use movable running surfaces for the containers to be moved.

- Those skilled in this field would notice immediately the problems resulting from this type of conveying systems,
30 especially concerning production and subsequent

effectiveness of the conveyors including movable supporting surfaces.

Other solutions provide stationary supporting surfaces equipped with suitable dragging means for moving the
5 containers.

Basically, the dragging means include one or more belts made of synthetic or metallic material with extensions applied thereto.

Pairs of adjacent extensions form seats for housing the
10 containers moved by the belt.

The publication DE-A-3209790 discloses a filling device equipped with a bottle conveyor systems made according to different embodiments.

In some of the embodiments described in this document,
15 the conveyor system includes a stationary support surface and a belt or a chain with fastened thereto means for picking up or pushing the bottles.

It is obvious that the construction of this type of dragging means is extremely difficult and complicated,
20 and therefore increases the device global production cost.

Also the effectiveness of the systems which use this type of dragging means is hindered by possible difficulties resulting from the behaviour of extensions, picking up
25 and pushing means carried by a belt or a chain, particularly with respect to bottles of different shapes.

In particular this last mentioned problem is considerably serious and very often can be solved only by substitution of the belt equipped with extensions with another more

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appropriate belt with extensions of different shape and/or mutually spaced with a different distance.

According to a particular embodiment, the dragging means include a rigid segment with semicircular seats, inside
5 which the bottles are pushed by a striker placed opposite to the segment.

The segment is moved with reciprocating motion both lengthwise, with a stroke at least equal to the distance between two seats, and sidewise, so as to describe a
10 rectangular trajectory.

It is evident that this type of the conveyor can be used only with bottles which have to move in an intermittent way.

Moreover, it is evident that the construction of this
15 type of dragging means is extremely difficult and complicated, and therefore increases the global production cost of the conveying system.

Moreover, it is not possible to perform additional operations on the containers, if there are not provided
20 complex devices for picking up single containers in different areas of the conveying surface.

SUMMARY OF THE INVENTION

A main object of the present invention is to provide a
25 conveying system of the above described type, with characteristics which simplify its production and, at the same time, improve its effectiveness.

Another object of the present invention is to provide a device that can be adapted widely and easily to all

possible shapes of containers to be conveyed, without complicated substitution and/or adjustment operations.

The above mentioned objects are obtained by a conveying device including:

- 5 - at least one stationary support element which defines a support and running surface for these containers;
- at least one dragging element designed to engage and move the containers resting on the support and running surface;
- 10 - at least one lateral striker for the containers, for enabling the dragging means to engage and move the containers;

the conveyor is characterised in that:

- 15 - the dragging element is formed by an endless motorised belt having an active straight run situated over a longitudinal edge of the support element;
- the edge of the active straight run which is turned toward the lateral striker is provided with seats regularly spaced out and situated over a corresponding
20 section of the support and running surface;
- the width of the seats decreases while they extend inwards;
- the lateral striker is formed by a bar that extends parallel to the active straight run of the belt and in
25 the region of a longitudinal lateral edge of the support and running surface, opposite to the belt;
- the dragging element and the bar can translate sidewise in relation to the containers size, maintaining said containers always centred with respect to a median line

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traced between them and crossing operative means located along the longitudinal extension of the conveyor.

In a first preferred embodiment, the belt is made of a synthetic material and is provided with dragging cogs
5 made on the inner surface of a closed loop defined by the belt.

In a second preferred embodiment the belt is made of a metallic material and the seats have inclined edges featuring flanges folded downwards.

10 The dragging element and the striker are made in such a way and controlled by such means that they produce corresponding references for the bottles to be moved.

Other features and variants of constructive details are pointed out in the subsequent dependent claims.

15

BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics of the invention, not pointed out yet, will become apparent from the following detailed description with specific reference to the enclosed
20 drawings, in which:

- Figure 1 is a plan schematic view of the device being the subject of the present invention;
- Figures 2a and 2b show a detailed view of a part of the device with two container having different dimensions;
- 25 - Figures 3a and 3b show a part of a belt made of synthetic material;
- Figure 4 is a section view of the belt illustrated in Figures 3a and 3b, taken along the line IV-IV;

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- Fig. 5 shows a part of the belt made of metallic material;

- Figure 6 is a section view of the device taken along the line VI-VI of the Fig. 1.

5

BEST MODES OF CARRYING OUT THE INVENTION

With reference to the previously described figures, the device for conveying containers 1, in particular bottles, through different working stations, not shown in the drawings, since generally known, includes a stationary
10 support element 4, that forms a surface 5 on which the containers 1 are supported and moved.

A dragging element 9,10 engages and moves the containers 1 resting on the surface 5, and a lateral striker 7 acts
15 on the containers 1 so as to keep them engaged with the dragging element 9, 10.

Both dragging element and support element form lateral references for the bottles being conveyed.

In the illustrated device, that is a non-limitative
20 example, the dragging element 9,10 is situated in the region of a lateral longitudinal edge 6 of the support element 4, while the lateral striker 7 is situated on the opposite side of the support element 4.

The dragging element 9,10 is formed by an endless belt,
25 that has seats 3,19 made along its longitudinal edge. The seats 3,19 are turned toward the lateral striker 7 and located over a corresponding area of the support and running surface 5.

The width of the seats 3,19 decreases while extending toward the other side of the belt. The seats are regularly spaced out.

5 The belt 9,10 is connected to drive means and its rotation axes are perpendicular to the orientation of the support and running surface 5.

The belt can be made of a synthetic material, as indicated with 9 in the Figures 3a and 3b, and in this case, it features dragging cogs made on the inner surface
10 of the closed-loop defined by the belt (see also Figure 4).

According to known techniques, the inside of the belt can be provided with steel filaments, so as to increase its resistance and rigidity.

15 Otherwise, the belt can be completely made of metallic material, e.g. steel, and in this case its opposite surfaces, resting on the supporting rollers, are smooth, while the inclined edges of the seats 19 have a flange 21 folded downwards, as seen in the example indicated with
20 10 in Figure 5.

The flange 21 widens the surface of the metallic belt which exerts a pushing action on the containers.

Moreover, the flange 21 increases the transversal rigidity of the protruding parts of the belt, between
25 which the seats 19 are delimited.

In this case, the belt can be dragged by using slots or holes 20, made longitudinally along the belt and regularly spaced apart, which engage with corresponding pins of a suitable moving device (see the Italian Patent

Application No. B096A 000649 filed on 12.12.1996 by the same Applicant).

The lateral striker 7, situated on the side of the support element 4 opposite with respect to the belt 9,10, is formed by a bar extending parallel to the straight active run 8 of the belt.

Both the bar 7 and the support element 4 can translate sidewise with respect to a median ideal line M traced between them and crossing the working means located along the longitudinal extension of the conveying device, as appears evident in Figure 6.

The sidewise reciprocal motion by which the bar 7 and the support element 4 are moved closer to or farther from each other, serves for varying the spaces left between the bar 7 and the seats 3,19 of the belt in relation to the dimension of the containers 1.

It is to be noted that the "V"-shape of the seats 3 19 allows to use the same belt for a wide range of bottles, without the necessity for frequent time-consuming substitutions.

The amplitude ratio between the sidewise movements of the belt and the lateral bar is so determined to keep the bottles always centred with respect to the median line M, and therefore with respect to the working means, e.g. filling nozzles.

The support and running surface 5 has one or more indentation 14, in the regions of which there are placed auxiliary means 13, which restore the surface 5 continuity.

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The auxiliary means 13 are controlled by operative means, not shown as not concerned with the present invention, that allow the performance of additional operations on the containers 1.

- 5 For this purpose, in this case, the belt 9,10 is moved stepwise and the auxiliary means 13 are activated during the breaks of the belt movement.

Also the auxiliary means 13 are moved sidewise so as to disengage from the belt 9,10 one or more bottles 1
10 supported thereby.

At the same time, a corresponding section 12 of the bar 7 is moved sidewise.

- When the movement is completed, the bottle 1 is free and can undergo additional operations, e.g. weighing (see,
15 for instance the corresponding Patent Application No. B096A 000650 filed on 12.12.1996 by the same Applicant).

Operation of the described device can be easily understood from the enclosed drawings.

- The bottles 1 are fed to the device by a feeding line,
20 not shown.

The bottles 1 are picked up from this feeding line by one or more carrousel devices 15,16, which space out the containers 1 and set them at a regular distance in accordance with the distance between the axes of the
25 seats 3,19 of the belt 9,10.

The bottles 1 are brought in the region of the belt 9,10 due to rotation of the carrousel conveyors 15,16. Deviation plates 17, suitably located, facilitate the introduction of the bottles into the respective seats

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3,19. The belt forms a first lateral reference for the containers.

Subsequently, the containers are kept in the seats by the bar 7, that forms a second lateral reference therefor.

5 By moving the bar 7 in the direction S, and of the belt 9, 10 in the direction T, i.e. away from each other as shown in Figure 2b, the space between the edges of the seats and the corresponding internal edge of the bar is increased, and containers of bigger diameter can be
10 introduced therebetween while maintaining them always in the correct centred position due to the "V"-form of the seats 3,19.

In order to create centred conditions, it is necessary, as has already been mentioned, to move not only the bar
15 7, but also the assembly supporting the containers with a predetermined ratio, so as to maintain always the central point of the containers in the seats 3,19 on the median line M.

The device constructive simplicity appears evident, since
20 there are not elements connected to the belt for making seats, and thus all the problems deriving from the presence of these additional elements are eliminated.

The cogs 11 of the belt 9, as well as the holes 20 in case of metallic belt 10, allow to obtain the best belt
25 dragging action and permit to set a phase relationship between the containers position and the location of working stations along the conveyor.

In other words, once the machine has been started, it is always possible to know the position of a predetermined
30 bottle, as they move along the support and running surface 5.

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This is made possible by the positive movement obtained by means of the belt provided with seats 3,19, inside which the bottles are introduced.

Finally, all the characteristics listed above allow
5 advantageously and with extreme practicality, to place the conveyor inside closed and limited environments, e.g. sterile or controlled atmosphere.

A particularly important advantage obtained by the belt conveyor lies in the fact that the cleaning and
10 sterilisation operations are extremely easy and safe.

In fact, the belt does not have hollows or areas difficult to reach, that could house dirt or dust, as could occur if extensions were present.

The above description is intended purely in terms of
15 exemplification, so any variations in practice from the above technical description are to be considered within the terms of this application and the following claims.

CLAIMS

1. A conveyor for carrying containers, especially bottles, through different working stations including:

- 5 - at least one stationary support element (4) which defines a support and running surface (5) for these containers (1);
- at least one dragging element (9,10) designed to engage and move the containers (1) resting on this support and
10 running surface (5);
- at least one lateral striker (7) for said containers (1), for enabling said dragging means (9,10) to engage and move said containers (1);

said conveyor being characterised in that

- 15 - said dragging element (9,10) is formed by an endless motorised belt having an active straight run (8) situated over a longitudinal edge (6) of the support element (6);
- one edge of said active straight run (8) which is turned toward said lateral striker (7) is provided with
20 seats (3,19) regularly spaced out and situated over a corresponding section of said support and running surface (5);
- the width of said seats (3,19) decreases while they extend inwards;
- 25 - said lateral striker (7) is formed by a bar that extends parallel to said active straight run (8) of said belt and in the region of a longitudinal lateral edge of said support and running surface (5), opposite to said belt;

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- said dragging element (9,10) and said bar are translated sidewise, in relation to said containers (1) size, maintaining said containers always centred with respect to an ideal median line (M) traced between them
5 and crossing operative means located along the longitudinal extension of the conveyor.

2. Device, according to claim 1, characterised in that said belt (9) is made of a synthetic material and is
10 provided with dragging cogs (11)

made on the inner surface of a closed loop defined by said belt.

3. Device, according to claim 1, characterised in that
15 said belt (10) is made of a metallic material and said seats (19) have inclined edges featuring flanges (21) folded downwards.

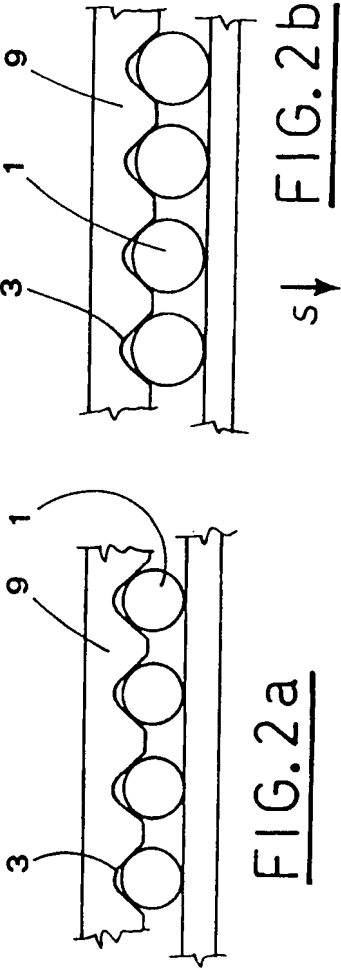
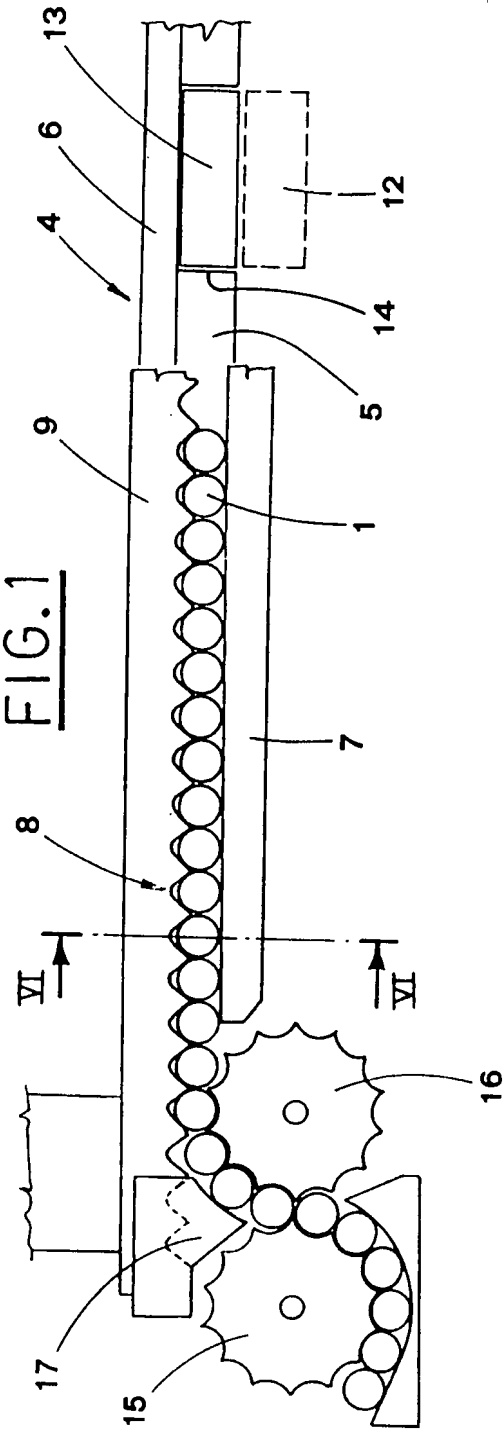
4. Device, according to claim 1, characterised in that
20 said support and running surface (5) is provided with at least one indentation (14), in the region of which there is an auxiliary element (13) that virtually restores the surface (5) continuity and is controlled by operative means which allow carrying out additional operations on
25 said containers during stops determined by stepwise motion of said belt (9,10).

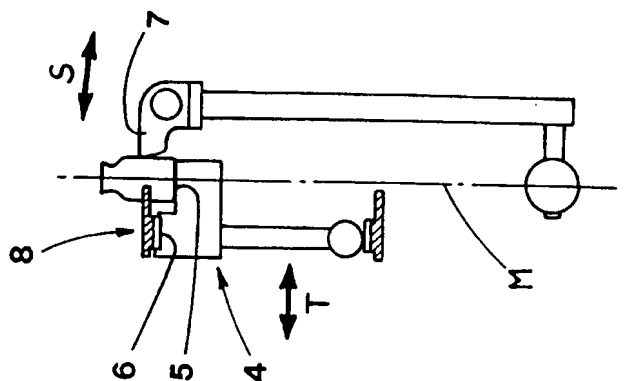
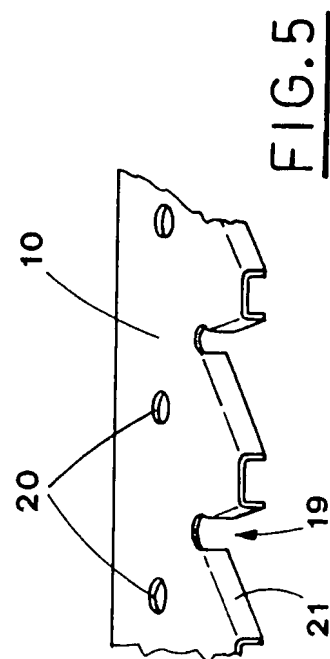
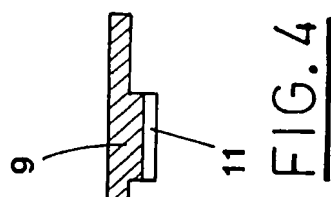
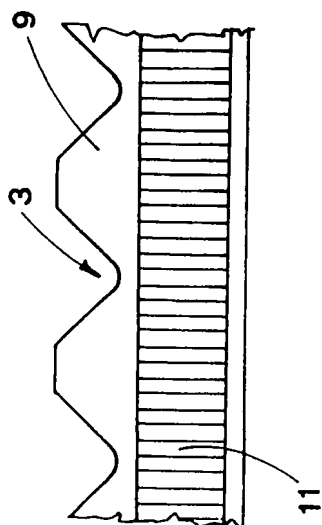
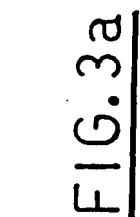
5. Device, according to claim 4, characterised in that said auxiliary element (13) is controlled by driving

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means which move them sidewise so as to disengage from the belt (9,10) one container (1) or more containers (1), said driving means also moving, at the same time, a corresponding section (12) of the bar (7) sidewise, so as to perform a weighing operation on said bottle (1) or said bottles (1).

6. Device, according to claim 1, characterised in that said support element (4) is moved sidewise together with said belt (9,10) in a direction (T) opposite with respect to said lateral striker (7), that is moved in a direction (S) transversal to the conveyor, when the containers (1) size is changed, so as to keep said containers (1) always centred with respect to said median line (M) and with respect to said operative means located along the longitudinal extension of the conveyor.





INTERNATIONAL SEARCH REPORT

International application No.

F /IB 97/01507

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65G 19/02, B65G 23/06 // B65G 21/04, B65B 35/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B65B, B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 2548613 A1 (KRONSEDER, HERMANN), 5 May 1977 (05.05.77), page 1, line 10, figures 1,2, claims 1, 2 --	1,6
Y	DE 2311927 A (EPCO GMBH FÜR MASCHINEN- UND ANLAGENBAU), 12 Sept 1974 (12.09.74), page 1 - page 3, figures 1-7, claims 1-3 --	1,2
Y	FR 1591106 A (BARRY-WEHMILLER COMPANY), 5 June 1970 (05.06.70), figures 1-5, claims 1,2 --	1,2,6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1592861 A (BARRY-WEHMILLER COMPANY), 26 June 1970 (26.06.70), page 1 - page 8, figures 1,5, claim 1 -- -----	1,3

INTERNATIONAL SEARCH REPORT

S' 177890

Information on patent family members

03/02/98

International application No.

PCT/IB 97/01507

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